

Multi-wavelength Ocean Profiling and Atmospheric Lidar

Completed Technology Project (2014 - 2017)



Project Introduction

We propose to build and demonstrate the world's first multi-wavelength ocean-profiling high spectral resolution lidar (HSRL). The lidar will provide profiles of plankton backscatter (bbp) and diffuse attenuation coefficient (Kd) at two wavelengths, 355 and 532 nm, via the HSRL technique. As part of this effort, we will advance the TRL of key instrument component technologies to lower the development time, risk, and cost of a future satellite instrument. We will develop high speed detection electronics to sample the ocean profile at 1 m vertical resolution, develop an advanced data acquisition and control system employing intelligent FPGA signal preprocessing and averaging, and demonstrate a novel, quasi-monolithic interferometer implementing the HSRL optical filter at 355 nm. We will also explore technologies to attenuate pernicious signal spikes from specular reflection of the laser from the ocean surface. These surface reflection spikes are a significant source of signal artifacts in ocean subsurface lidar signals, and we will implement the following technologies to reduce these surface spikes: (1) fast photo-multiplier tube (PMT) gating circuits that will reduce PMT gain for the duration of the surface spike, (2) new hybrid detectors that have improved immunity to after-pulsing common to PMTs, and (3) application of Pockels cells in the receiver to optically attenuate the surface reflectance. We will integrate the most promising of these technologies along with the new instrument controller and interferometer into a new receiver for the existing HSRL-2 instrument and characterize the performance of the new instrument in ground and flight tests. We exit the project with an operational ocean-optimized multi-wavelength HSRL instrument that will serve as an airborne prototype for a future space-based instrument. In addition to key new ocean remote sensing capability, the instrument will provide the atmospheric aerosol products called for by the Aerosol-Clouds-Ecosystems mission of the Decadal Survey.



ALHAT - ETD Autonomous
Landing & Hazard Avoidance
Tech Earth Science Technology
Office

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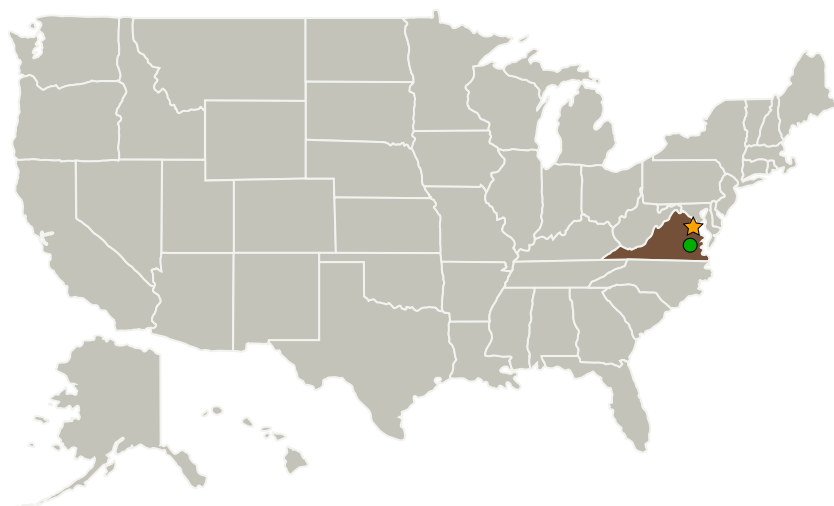
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Virginia

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Instrument Incubator

Project Management

Program Director:

Pamela S Millar

Program Manager:

Parminder S Ghuman

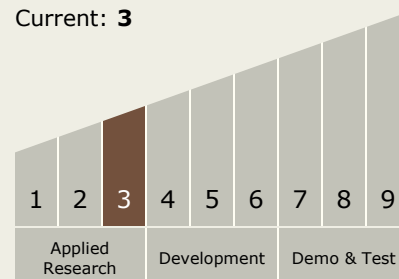
Principal Investigator:

Chris A Hostetler

Co-Investigator:

Rebecca W Bales

Technology Maturity (TRL)

Start: 3
Current: 3

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Images



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(<https://techport.nasa.gov/image/5116>)

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.5 Lasers

Target Destination

Earth